

ASPECTS OF NATURE,
IN
DIFFERENT LANDS AND DIFFERENT CLIMATES ;
WITH
Scientific Elucidations.

BY
ALEXANDER VON HUMBOLDT.

TRANSLATED BY MRS. SABINE.

TWO VOLUMES IN ONE.

LONDON :
PRINTED FOR
LONGMAN, BROWN, GREEN, AND LONGMANS,
PATERNOSTER ROW; AND
JOHN MURRAY, ALBEMARLE STREET.
1850.

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AUTHOR'S PREFACE

TO THE

FIRST EDITION.

It is not without diffidence that I present to the public a series of papers which took their origin in the presence of natural scenes of grandeur or of beauty,—on the Ocean, in the forests of the Orinoco, in the Steppes of Venezuela, and in the mountain wildernesses of Peru and Mexico. Detached fragments were written down on the spot and at the moment, and were afterwards moulded into a whole. The view of Nature on an enlarged scale, the display of the concurrent action of various forces or powers, and the renewal of the enjoyment which the immediate prospect of tropical scenery affords to sensitive minds, are the objects which I have proposed to myself. According to the design of my work, whilst each of the treatises of which it consists should form a whole complete in itself, one common tendency should pervade them all. Such an artistic and

literary treatment of subjects of natural history is liable to difficulties of composition, notwithstanding the aid which it derives from the power and flexibility of our noble language. The unbounded riches of Nature occasion an accumulation of separate images ; and accumulation disturbs the repose and the unity of impression which should belong to the picture. Moreover, when addressing the feelings and imagination, a firm hand is needed to guard the style from degenerating into an undesirable species of poetic prose. But I need not here describe more fully dangers which I fear the following pages will shew I have not always succeeded in avoiding.

Nevertheless, notwithstanding faults which I can more easily perceive than amend, I venture to hope that these descriptions of the varied Aspects which Nature assumes in distant lands, may impart to the reader a portion of that enjoyment which is derived from their immediate contemplation by a mind susceptible of such impressions. As this enjoyment is enhanced by insight into the more hidden connection of the different powers and forces of nature, I have subjoined to each treatise scientific elucidations and additions.

Throughout the entire work I have sought to indicate the unfailing influence of external nature on the feelings, the moral dispositions, and the destinies of man. To minds oppressed with the cares or the sorrows of life, the soothing influence of the contemplation of nature is peculiarly precious; and to such these pages are more especially dedicated. May they, "escaping from the stormy waves of life," follow me in spirit with willing steps to the recesses of the primeval forests, over the boundless surface of the Steppe, and to the higher ridges of the Andes. To them is addressed the poet's voice, in the sentence of the Chorus—

"Auf den Bergen ist Freiheit! Der Hauch der Gräfte
Steigt nicht hinauf in die reinen Lüfte;
Die Welt ist vollkommen überall,
Wo der Mensch nicht hinkommt mit seiner Qual."

AUTHOR'S PREFACE

TO THE

SECOND AND THIRD EDITIONS.

THE twofold aim of the present work (a carefully prepared and executed attempt to enhance the enjoyment of Nature by animated description, and at the same time to increase in proportion to the state of knowledge at the time the reader's insight into the harmonious and concurrent action of different powers and forces of Nature) was pointed out by me nearly half a century ago in the Preface to the First Edition. In so doing, I alluded to the various obstacles which oppose a successful treatment of the subject in the manner designed. The combination of a literary and of a purely scientific object,—the endeavour at once to interest and occupy the imagination, and to enrich the mind with new ideas by the augmentation of knowledge,—renders the due arrangement of the separate parts, and the desired unity of composition, difficult of attainment. Yet, notwithstanding these dis-

NOTE BY THE TRANSLATOR.

IN the translation the temperatures are given in degrees of Fahrenheit, retaining at the same time the original figures in Reaumur's scale. In the same manner the measures are given in English feet, generally retaining at the same time the original statements in Parisian or French feet or toises, a desirable precaution where accuracy is important. The miles are given in geographical miles, 60 to a degree, but in this case the original figures have usually been omitted, the conversion being so simple as to render the introduction of error very improbable. In a very few instances "English miles" appear without any farther epithet or explanation; these have been taken by the author from English sources, and may probably signify statute miles. The longitudes from Greenwich are substituted for those from Paris, retaining in addition the original statement in particular cases.

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STEPPES AND DESERTS.

ASPECTS OF NATURE

IN

DIFFERENT LANDS AND DIFFERENT CLIMATES.

STEPPES AND DESERTS.

A WIDELY extended and apparently interminable plain stretches from the southern base of the lofty granitic crest, which, in the youth of our planet, when the Caribbean gulf was formed, braved the invasion of the waters. On quitting the mountain valleys of Caraccas, and the island-studded lake of Tacarigua ⁽¹⁾ whose surface reflects the stems of plantains and bananas, and on leaving behind him meads adorned with the bright and tender green of the Tahitian sugar cane or the darker verdure of the Cacao groves, the traveller, looking southward, sees unroll before him Steppes receding until they vanish in the far horizon.

Fresh from the richest luxuriance of organic life, he treads at once the desolate margin of a treeless desert. Neither hill nor cliff rises, like an island in the ocean, to break the uniformity of the boundless plain; only here and there

STEPPES AND DESERTS.

broken strata of limestone, several hundred square miles in extent, appear sensibly higher than the adjoining parts. "Banks" (2) is the name given to them by the natives; as if language instinctively recalled the more ancient condition of the globe, when those elevations were shoals, and the Steppes themselves were the bottom of a great Mediterranean sea.

Even at the present time nocturnal illusion still recalls these images of the past. When the rapidly rising and descending constellations illumine the margin of the plain, or when their trembling image is repeated in the lower stratum of undulating vapour, we seem to see before us a shoreless ocean. (3) Like the ocean, the Steppe fills the mind with the feeling of infinity; and thought, escaping from the visible impressions of space, rises to contemplations of a higher order. Yet the aspect of the clear transparent mirror of the ocean, with its light, curling, gently foaming, sportive waves, cheers the heart like that of a friend; but the Steppe lies stretched before us dead and rigid, like the stony crust (4) of a desolated planet.

In every zone nature presents the phenomena of these great plains: in each they have a peculiar physiognomy, determined by diversity of soil, by climate, and by elevation above the level of the sea.

In northern Europe, the Heaths, which, covered with a single race of plants repelling all others, extend from the point of Jutland to the mouth of the Scheldt, may be regarded as true Steppes,—but Steppes of small extent and hilly surface, if compared with the Llanos and Pampas of

South America, or even with the Prairies of the Missouri ⁽⁵⁾ and the Barrens of the Coppermine river, where range countless herds of the shaggy buffalo and musk ox.

A grander and severer aspect characterises the plains of the interior of Africa. Like the wide expanse of the Pacific Ocean, it is only in recent times that attempts have been made to explore them thoroughly. They are parts of a sea of sand, which, stretching eastward, separates fruitful regions from each other, or encloses them like islands; as where the Desert, near the basaltic mountains of Harudsh, ⁽⁶⁾ surrounds the Oasis of Siwah rich in date trees, and in which the ruins of the temple of Ammon mark the venerable site of an ancient civilisation. Neither dew nor rain bathe these desolate plains, or develope on their glowing surface the germs of vegetable life; for heated columns of air, every where ascending, dissolve the vapours, and disperse each swiftly vanishing cloud.

Where the Desert approaches the Atlantic Ocean, as between the Wadi Nun and Cape Blanco, the moist sea air pours in to supply the void left by these upward currents. The mariner, steering towards the mouth of the Gambia through a sea covered with weed, when suddenly deserted by the east trade wind of the tropics, ⁽⁷⁾ infers the vicinity of the widely extended heat-radiating desert. Herds of antelopes and swift-footed ostriches roam through these vast regions; but, with the exception of the watered Oases or islands in the sea of sand, some groups of which have recently been discovered, and whose verdant shores are frequented by nomade Tibbos and Tuaricks, ⁽⁸⁾ the African

Desert must be regarded as uninhabitable by man. The more civilised nations who dwell on its borders only venture to enter it periodically. By trading routes, which have remained unaltered for thousands of years, caravans traverse the long distance from Tafilet to Timbuctoo, and from Moorzouk to Bornou; adventurous undertakings, the possibility of which depends upon the existence of the camel, the "ship of the desert," (9) as it is called in the traditionary language of the eastern world.

These African plains occupy an extent nearly three times as great as that of the neighbouring Mediterranean sea. They are situated partly within, and partly in the vicinity of the tropics; and on this situation their peculiar character depends. In the eastern part of the old continent, the same geognostic phenomenon occurs in the temperate zone. On the plateaux of central Asia, between the gold mountains or the Altai and the Kuen-lun, (10) from the Chinese wall to beyond the Celestial mountains, and towards the sea of Aral, there extend, through a length of many thousand miles, the most vast, if not the most elevated, Steppes on the surface of the globe. I have myself had the opportunity, fully thirty years after my South American journey, of visiting a portion of them; namely, the Calmuck Kirghis Steppes between the Don, the Volga, the Caspian, and the Chinese lake Dsaisang, being an extent of almost 2800 geographical miles.

These Asiatic Steppes, which are sometimes hilly and sometimes interrupted by pine forests, possess (dispersed over them in groups) a far more varied vegetation than that

of the Llanos and Pampas of Caraccas and Buenos Ayres. The finest part of these plains, which is inhabited by Asiatic pastoral tribes, is adorned with low bushes of luxuriant white-blossomed Rosaceæ, and with Fritillarias, Tulips, and Cypripedias.

As the torrid zone is characterised on the whole by a disposition in all vegetation to become arborescent, so some of the Asiatic Steppes in the temperate zone are characterised by the great height attained by flowering herbaceous plants, Saussureas and other Symplocaræ, and Papilionaceæ especially a host of species of Astragalus. In traversing pathless portions of these Steppes, the traveller, seated in the low Tartar carriages, sees the thickly crowded plants bend beneath the wheels, but without rising up cannot look around him to see the direction in which he is moving. Some of the Asiatic Steppes are grassy plains; others are covered with succulent, evergreen, articulated soda plants: many glisten from a distance with flakes of exuded salt which cover the clayey soil, not unlike in appearance to fresh fallen snow.

These Mongolian and Tartarian Steppes, interrupted frequently by mountainous features, divide the very ancient civilisation of Thibet and Hindostan from the rude nations of Northern Asia. They have in various ways exercised an important influence on the changeful destinies of man. They have compressed the population towards the south, and have tended, more than the Himalaya, or than the snowy mountains of Srinagur and Ghorka, to impede the intercourse of nations, and to place permanent limits to the extension

of milder manners, and of artistic and intellectual cultivation in northern Asia.

But, in the history of the past, it is not alone as an opposing barrier that we must regard the plains of Central Asia: more than once they have proved the source from whence devastation has spread over distant lands. The pastoral nations of these Steppes,—Moguls, Getæ, Alani, and Usuni,—have shaken the world. As in the course of past ages, early intellectual culture has come like the cheering light of the sun from the East, so, at a later period, from the same direction barbaric rudeness has threatened to overspread and involve Europe in darkness. A brown pastoral race,⁽¹¹⁾ of Tukiuish or Turkish descent, the Hiongnu, dwelling in tents of skins, inhabited the elevated Steppe of Gobi. Long terrible to the Chinese power, a part of this tribe was driven back into Central Asia. The shock or impulse thus given passed from nation to nation, until it reached the ancient land of the Finns, near the Ural mountains. From thence, Huns, Avari, Ghazarés, and various admixtures of Asiatic races, broke forth. Armies of Huns appeared successively on the Volga, in Pannonia, on the Marne, and on the Po, desolating those fair and fertile fields which, since the time of Antenor, civilised man had adorned with monument after monument. Thus went forth from the Mongolian deserts a deadly blast, which withered on Cisalpine ground the tender long-cherished flower of art.

From the salt Steppes of Asia, from the European Heaths smiling in summer with their purple blossoms rich in honey,

and from the arid Deserts of Africa devoid of all vegetation, let us now return to those South American plains of which I have already begun to trace the picture, albeit in rude outlines.

The interest which this picture can offer to the beholder is, however, exclusively that of pure nature. Here no Oasis recalls the memory of earlier inhabitants; no carved stone, ⁽¹²⁾ no ruined building, no fruit tree once the care of the cultivator but now wild, speaks of the art or industry of former generations. As if estranged from the destinies of mankind, and riveting attention solely to the present moment, this corner of the earth appears as a wild theatre for the free development of animal and vegetable life.

The Steppe extends from the Caraccas coast chain to the forests of Guiana, and from the snowy mountains of Merida (on the slope of which the Natron Lake Urao is an object of superstitious veneration to the natives,) to the great delta formed by the Orinoco at its mouth. To the south-west a branch is prolonged, like an arm of the sea, ⁽¹³⁾ beyond the banks of the Meta and Vichada to the unvisited sources of the Guaviare, and to the lonely mountain to which the excited fancy of the Spanish soldiery gave the name of Paramo de la Suma Paz—the seat of perfect peace.

This Steppe occupies a space of 10,000 (256,000 English) square miles. It has often been erroneously described as running uninterruptedly, and with an equal breadth, to the straits of Magellan, forgetting the forest-covered plain of the Amazons which intervenes between the grassy Steppes of the Apure and those of the river Plate. The Andes of

Cochabamba, and the Brazilian group of 'mountains, send forth, between the province of Chiquitos and the isthmus of Villabella, some detached spurs, which advance, as it were, to meet each other. (14) A narrow plain connects the forest lands of the Amazons with the Pampas of Buenos Ayres. The latter far surpass the Llanos of Venezuela in area; and their extent is so great that while their northern margin is bordered by palm trees, their southern extremity is almost continually covered with ice.

The Tuyu, which resembles the Cassowary (the *Struthio rhea*), is peculiar to these Pampas, which are also the haunt of troops of dogs (15) descended from those introduced by the colonists, but which have become completely wild, dwelling together in subterranean hollows, and often attacking with blood-thirsty rage the human race whom their progenitors served and defended.

Like the greater portion of the desert of Sahara, (16) the northernmost of the South American plains, the Llanos, are in the torrid zone: during one half of the year they are desolate, like the Lybian sandy waste; during the other, they appear as a grassy plain, resembling many of the Steppes of Central Asia. (17)

It is a highly interesting though difficult task of general geography to compare the natural conditions of distant regions, and to represent by a few traits the results of this comparison. The causes which lessen both heat and dryness in the New World (18) are manifold, and in some respects as yet only partially understood. Amongst these may be classed the narrowness and deep indentation of the

American land in the northern part of the torrid zone, where consequently the atmosphere, resting on a liquid base, does not present so heated an ascending current ;—the extension of the continent towards the poles ;—the expanse of ocean over which the trade-winds sweep freely, acquiring thereby a cooler temperature ;—the flatness of the eastern coasts ;—currents of cold sea-water from the antarctic regions, which, coming from the south-west to the north-east, first strike the coast of Chili in the parallel of 35° south latitude, and advance along the coast of Peru as far north as Cape Paríña, and then turn suddenly to the west ;—the numerous lofty mountain chains rich in springs, and whose snow-clad summits, rising high above all the strata of clouds, cause descending currents of cold air to roll down their declivities ;—the abundance of rivers of enormous breadth, which, after many windings, seek the most distant coast ;—Steppes which from not being sandy are less susceptible of acquiring a high degree of heat,—impenetrable forests occupying the alluvial plains situated immediately beneath the equator, protecting with their shade the soil beneath from the direct influence of the sunbeams, and exhaling in the interior of the country at a great distance from the mountains and from the ocean vast quantities of moisture, partly imbibed and partly elaborated :—all these circumstances afford to the flat part of America a climate which by its humidity and coolness contrasts wonderfully with that of Africa. It is to the same causes that we are to attribute the luxuriant vegetation, the magnificent forests, and that abundant leafiness by which the new continent is peculiarly characterised.

If, therefore, one side of our planet has a moister atmosphere than the other, the consideration of the present condition of things is amply sufficient to explain the problem presented by this inequality. The physical inquirer needs not to clothe the explanation of these phenomena in a mantle of geological myths. He needs not to assume that on our planet the harmonious reconciliation of the destructive conflict of the elements took place at different epochs in the eastern and the western hemispheres; or that America emerged later than the other parts of the globe from the chaotic watery covering, ⁽¹⁹⁾ as an island of swamps and marshes tenanted by alligators and serpents.

There is, indeed, a striking similarity between South America and the southern peninsula of the old continent in the form of the outline and in the direction of the coasts; but the nature of the soil, and the relative position of the neighbouring masses of land, produce in Africa that extraordinary aridity which over an immense area checks the development of organic life. Four-fifths of South America are situated on the southern side of the equator; or in a hemisphere which from the greater proportion of sea and from other causes is cooler and moister than our northern half of the globe, ⁽²⁰⁾ to which the larger part of Africa belongs. The breadth of the South American Steppe, measured from east to west, is only a third of that of the African Desert. The Llanos receive the influence of the tropical sea wind, while the African Deserts, being situated in the same zone of latitude as Arabia and the south of Persia, are in contact with strata of air which have blown

over warm heat-radiating continents. The venerable and only lately appreciated father of history, Herodotus, in the true spirit of an enlarged view of nature, described the Deserts of northern Africa, of Yemen, of Kerman and Mekran (the Gedrosia of the Greeks), and even as far as Moultan, as forming a single connected sea of sand. (21)

In addition to the action of these hot winds, there is (so far as we know) an absence or comparative paucity in Africa of large rivers, of widely extended forests producing coolness and exhaling moisture, and of lofty mountains. Of mountains covered with perpetual snow, we know only the western part of the Atlas, (22) whose narrow range, seen in profile from the Atlantic, appeared to the ancient navigators when sailing along the coast as a single detached lofty sky-supporting mount. The eastern prolongation of the chain extends nearly to Dakul, where Carthage, once mistress of the seas, now lies in mouldering ruins. As forming a long extended coast-chain, or Gætulian rampart, the effect of the Atlas range is to intercept the cool north breezes, and the vapours which ascend from the Mediterranean.

The Mountains of the Moon, Djebel-al-Komr, (23) (fabulously represented as forming part of a mountainous parallel extending from the high plateaux of Habesh, an African Quito, to the sources of the Senegal), were supposed to rise above the limit of perpetual snow. The Cordillera of Lupata, which extends along the eastern coast of Mozambique and Monomotapa, as the Andes along the

the history of the peopling of Japan (²⁹) in the time of Thsinchi-huang-ti offers a memorable example), may have been driven by storms to the coasts of New California.

If, then, pastoral life, that beneficent middle stage which attaches nomadic hunting hordes to desirable pastures and prepares them, as it were, for agriculture, has remained unknown to the aboriginal nations of America, this circumstance sufficiently explains the absence of human inhabitants in the South American Steppes. This absence has allowed the freest scope for the abundant development of the most varied forms of animal life; a development limited only by their mutual pressure, and similar to that of vegetable life in the forests of the Orinoco, where the *Hymenæa* and the gigantic laurel are never exposed to the destructive hand of man, but only to the pressure of the luxuriant climbers which twine around their massive trunks. Agoutis, small spotted antelopes, cuirassed armadilloes, which, like rats, startle the hare in its subterranean holes, herds of lazy chiguires, beautifully striped viverræ which poison the air with their odour, the large maneless lion, spotted jaguars (often called tigers) strong enough to drag away a young bull after killing him;—these and many other forms of animal life (³⁰) wander through the treeless plain.

Thus almost exclusively inhabited by these wild animals, the Steppe would offer little attraction or means of subsistence to those nomadic native hordes, who, like the Asiatics of Hindostan, prefer vegetable nutriment, if it were not for the occasional presence of single individuals of the fan palm, the *Mauritia*. The benefits of this life-supporting

tree are widely celebrated ; it alone, from the mouth of the Orinoco to north of the Sierra de Imataca, feeds the unsubdued nation of the Guaranis. ⁽³¹⁾ When this people were more numerous and lived in closer contiguity, not only did they support their huts on the cut trunks of palm trees as pillars on which rested a scaffolding forming the floor, but they also, it is said, twined from the leaf-stalks of the *Mauritia* cords and mats, which, skilfully interwoven and suspended from stem to stem, enabled them in the rainy season, when the Delta is overflowed, to live in the trees like the apes. The floor of these raised cottages is partly covered with a coating of damp clay, on which the women make fires for household purposes,—the flames appearing at night from the river to be suspended high in air. The Guaranis still owe the preservation of their physical, and perhaps also their moral independence, to the half-submerged, marshy soil over which they move with a light and rapid step, and to their elevated dwellings in the trees,—a habitation never likely to be chosen from motives of religious enthusiasm by an American Stylites. ⁽³²⁾ But the *Mauritia* affords to the Guaranis not merely a secure dwelling-place, but also various kinds of food. Before the flower of the male palm tree breaks through its tender sheath, and only at that period of vegetable metamorphosis, the pith of the stem of the tree contains a meal resembling sago, which, like the farina of the *jatropha* root, is dried in thin bread-like slices. The fermented juice of the tree forms the sweet intoxicating palm wine of the Guaranis. The scaly fruits, which resemble in their appearance reddish fir cones, afford,

rain. Hardly has the surface of the earth received the refreshing moisture, before the previously barren Steppe begins to exhale sweet odours, and to clothe itself with *Kyllingias*, the many panicles of the *Paspalum*, and a variety of grasses. The herbaceous mimosas, with renewed sensibility to the influence of light, unfold their drooping slumbering leaves to greet the rising sun ; and the early song of birds, and the opening blossoms of the water plants, join to salute the morning. The horses and cattle now graze in full enjoyment of life. The tall springing grass hides the beautifully spotted jaguar, who lurking in safe concealment, and measuring carefully the distance of a single bound, springs, cat-like, as the Asiatic tiger, on his passing prey.

Sometimes, (so the Aborigines relate), on the margin of the swamps the moistened clay is seen to blister and rise slowly in a kind of mound ; then with a violent noise, like the outbreak of a small mud volcano, the heaped-up earth is cast high into the air. The beholder acquainted with the meaning of this spectacle flies, for he knows there will issue forth a gigantic water-snake or a scaly crocodile, awakened from a torpid state ⁽³⁹⁾ by the first fall of rain.

The rivers which bound the plain to the south, the Arauca, Apure, and Payara, become gradually swollen ; and now nature constrains the same animals, who in the first half of the year panted with thirst on the dry and dusty soil, to adopt an amphibious life. A portion of the Steppe now presents the aspect of a vast inland sea. ⁽⁴⁰⁾ The brood mares retire with their foals to the higher banks, which stand like islands above the surface of the lake.

Every day the space remaining dry becomes smaller. The animals, crowded together, swim about for hours in search of other pasture, and feed sparingly on the tops of the flowering grasses rising above the seething surface of the dark-coloured water. Many foals are drowned, and many are surprised by the crocodiles, killed by a stroke of their powerful notched tails, and devoured. It is not a rare thing to see the marks of the pointed teeth of these monsters on the legs of the horses and cattle who have narrowly escaped from their blood-thirsty jaws. Such a sight reminds the thoughtful observer involuntarily of the capability of conforming to the most varied circumstances, with which the all-providing Author of Nature has endowed certain animals and plants.

The ox and the horse, like the farinaceous cerealia, have followed man over the whole surface of the globe, from India to Northern Siberia, from the Ganges to the River Plate, from the African sea shore to the mountain plateau of Antisana, (⁴¹) which is higher than the summit of the Peak of Teneriffe. The ox wearied from the plough reposes, sheltered from the noontide sun in one country by the quivering shadow of the northern birch, and in another by the date palm. The same species which, in the east of Europe, has to encounter the attacks of bears and wolves, is exposed in other regions to the assaults of tigers and crocodiles.

But the crocodile and jaguar are not the only assailants of the South American horses; they have also a dangerous enemy among fishes. The marshy waters of Bera and

In the midst of this grand and savage nature live many tribes of men, isolated from each other by the extraordinary diversity of their languages: some are nomadic, wholly unacquainted with agriculture, and using ants, gums, and earth as food (⁵⁰); these, as the Otomacs and Jarures, seem a kind of outcasts from humanity: others, like the Maquiritares and Macos, are settled, more intelligent and of milder manners, and live on fruits which they have themselves reared.

Large spaces between the Cassiquiare and the Atabapo are only inhabited by the tapir and the social apes, and are wholly destitute of human beings. Figures graven on the rocks (⁵¹) shew that even these deserts were once the seat of some degree of intellectual cultivation. They bear witness to the changeful destinies of man, as do the unequally developed flexible languages; which latter belong to the oldest and most imperishable class of historic memorials.

But as in the Steppe tigers and crocodiles fight with horses and cattle, so in the forests on its borders, in the wildernesses of Guiana, man is ever armed against man. Some tribes drink with unnatural thirst the blood of their enemies; others apparently weaponless and yet prepared for murder (⁵²) kill with a poisoned thumb-nail. The weaker hordes, when they have to pass along the sandy margin of the rivers, carefully efface with their hands the traces of their timid footsteps. Thus man in the lowest stage of almost animal rudeness, as well as amidst the apparent brilliancy of our higher cultivation, prepares for himself and his fellow

men increased toil and danger. The traveller wandering over the wide globe by sea and land, as well as the historic inquirer searching the records of past ages, finds every where the uniform and saddening spectacle of man at variance with man.

He, therefore, who, amidst the unreconciled discord of nations, seeks for intellectual calm, gladly turns to contemplate the silent life of vegetation, and the hidden activities of forces and powers operating in the sanctuaries of nature; or, obedient to the inborn impulse which for thousands of years has glowed in the human breast, gazes upwards in meditative contemplation on those celestial orbs, which are ever pursuing in undisturbed harmony their ancient and unchanging course.

ANNOTATIONS AND ADDITIONS.

(¹) p. 1.—“*The Lake of Tacarigua.*”

In proceeding through the interior of South America from the Caraccas or Venezuela shore towards the boundary of Brazil, from the 10th degree of North latitude to the Equator, the traveller crosses first an elevated mountain-chain running in an east and west direction, next vast treeless Steppes or Plains (los Llanos), which stretch from the foot of the above-named mountains (the coast chain of Caraccas) to the left bank of the Orinoco, and lastly the range which occasions the Cataracts of Atures and Maypure. This latter range of mountains, to which I have given the name of the Sierra Parime, runs in an easterly direction from the Cataracts to Dutch and French Guiana. It is a mass of mountains divided into many parallel ridges, and is the site of the fabled Dorado. It is bordered on the south by the forest plain, through which the river of the Amazons and the Rio Negro have formed the channels in which their waters flow. Those who desire a fuller acquaintance with the geography of these regions will do well to consult and compare the great map of La Cruz-Olmiedilla, bearing date 1775, (from which almost all the more recent maps of South America have been formed,) and the map of Columbia

constructed by me from my own astronomical determinations of geographical positions, and published in 1825.

The coast chain of Venezuela, geographically considered, is a part of the chain of the Andes of Peru. The chain of the Andes divides itself, at the great mountain junction at the sources of the Magdalena, south of Popayan, (between $1^{\circ} 55'$ and $2^{\circ} 20'$ latitude), into three chains, the easternmost of which terminates in the snow-covered mountains of Merida. These mountains sink down towards the Paramo de las Rosas into the hilly land of Quibor and Tocuyo, which connects the coast chain of Venezuela with the Cordilleras of Cundinamarca. The coast chain forms an unbroken rampart from Porto Cabello to the promontory of Paria. Its mean height hardly equals 750 toises or 4795 English feet; yet single summits, like the Silla de Caracas (also called Cerro de Avila), decked with the purple-flowering Befaria the American Rose of the Alps, rise 1350 toises or 8630 English feet above the level of the sea. The coast of Terra Firma bears traces of devastation. We recognise everywhere the action of the great current which, sweeping from east to west, formed by disruption the West Indian Islands, and hollowed out the Caribbean gulf. The projecting tongues of land of Araya and Chuparipari, and especially the coast of Cumana and New Barcelona, offer a remarkable spectacle to the geologist. The precipitous Islands of Boracha, Caracas, and Chimanas, rise like towers from the sea, and bear witness to the terrible pressure of the waters against the mountain chain when it was broken by their irruption. Perhaps, like the Mediterranean, the Antillean gulf was once an inland

sea, which became suddenly connected with the ocean. The islands of Cuba, Hayti, and Jamaica, still contain the remnants of the lofty mountains of mica slate which bounded this sea to the north. It is remarkable that where these three islands approach each other most nearly the highest summits are found; and we may conjecture that the highest part of this Antillean chain was situated between Cape Tiburon and Point Morant. The Copper Mountains (*Montañas de Cobre*) near Santiago de Cuba have not yet been measured, but their elevation is probably greater than that of the Blue Mountains of Jamaica, (1138 toises, 7277 English feet,) which somewhat exceeds the height of the St. Gothard Pass. My conjectures on the valley-form of the Atlantic Ocean, and on the ancient connection of the continents, were given more in detail in a memoir written in Cumana, entitled *Fragment d'un Tableau Géologique de l'Amerique Meridionale* (*Journal de Physique*, Messidor, An. IX.) It is worthy of remark, that Columbus himself, in his Official Reports, called attention to the connection between the direction of the equatorial current and the form of the coast line of the larger Antilles. (*Examen critique de l'hist. de la Géographie*, p. 104-108.)

The northern and most cultivated part of the province of Caraccas is a country of mountains. The coast chain is divided like the Swiss Alps into several subordinate chains enclosing longitudinal valleys. The most celebrated of these is the pleasant valley of Aragua, which produces a great quantity of indigo, sugar, cotton, and, what is most re-

markable, European wheat. The southern margin of this valley adjoins the beautiful lake of Valencia, whose old Indian name is Tacarigua. The contrast between its opposite shores gives it a striking resemblance to the Lake of Geneva. It is true that the bare mountains of Guigue and Guiripa have less grandeur of character than the Savoy Alps; but, on the other hand, the opposite bank of the Tacarigua lake, which is thickly clothed with plantains, mimosas, and triplaris, far surpasses in picturesque beauty the vineyards of the Pays de Vaud. The lake is about thirty geographical miles in length, and is full of small islands, which, as the loss of water by evaporation exceeds the influx, are increasing in size. Within some years sandbanks have even become real islands, and have received the significant name of the "Newly Appeared," Las Aparcidas. On the island of Cura the remarkable species of *Solanum* is cultivated which has edible fruit, and which Wildenow has described in the *Hortus Berolinensis* (1816, Tab. xxvii.) The height of the Lake of Tacarigua above the sea is almost 1400 French feet, (according to my measurement exactly 230 toises, or 1470 English feet,) less than the mean height of the valley of Caraccas. The lake has several kinds of fish (see my *Observations de Zoologie et d'Anatomie comparée*, T. ii p. 179-181), and is one of the most pleasing natural scenes which I know in any part of the globe. In bathing, Bonpland and myself were often alarmed by the appearance of the Bava, an undescribed crocodile-like lizard, three or four feet in length, of repulsive aspect, but harmless to men. We found in the lake a

Typha (Cats-tail), identical with the European *Typha angustifolia*; a singular fact, and important in reference to the geography of plants.

Two varieties of sugar-cane are cultivated near the lake, in the valleys of Aragua: the common sugar-cane of the West Indies, *Caña criolla*; and the cane recently introduced from the Pacific, *Caña de Otaheiti*. The verdure of the Tahitian cane is of a much lighter and more agreeable tint, and a field of it can readily be distinguished at a great distance from a field of the common cane. The sugar-cane of Tahiti was first described by Cook and George Forster, who appear, however, from the excellent memoir of the latter upon the edible plants of the islands of the Pacific, to have been but little acquainted with its valuable qualities. Bougainville brought it to the Isle of France, from whence it was conveyed to Cayenne, and since 1792 it has been taken to Martinique, Hayti, and several of the smaller West Indian Islands. It was carried with the bread-fruit tree to Jamaica by the brave but unfortunate Captain Bligh, and was introduced from the Island of Trinidad to the neighbouring coast of Caraccas, where it became a more important acquisition than the bread-fruit, which is never likely to supersede a plant so valuable and affording so large an amount of sustenance as the plantain. The Tahitian sugar-cane is much richer in juice than the common cane, said to be originally a native of the east of Asia. On an equal surface of ground it yields a third more sugar than the *caña criolla*, which has a thinner stalk and smaller joints. As, moreover, the West India islands begin to suffer great want of fuel, (in Cuba

singular aspect of this sea-like desert plain. As far as the eye can reach, it can hardly rest on a single object a few inches high. If it were not that the state of the lowest strata of the atmosphere, and the consequent changes of refraction, render the horizon continually indeterminate and undulating, altitudes of the sun might be taken with the sextant from the margin of the plain as well as from the horizon at sea. This great horizontality of the former sea bottom makes the "banks" more striking. They are broken strata which rise abruptly from two to three feet above the surrounding rock, and extend uniformly over a length of from 40 to 48 English geographical miles. The small streams of the Steppes take their rise on these banks.

In passing through the Llanos of Barcelona, on our return from the Rio Negro, we found frequent traces of earthquakes. Instead of the banks standing *higher* than the surrounding rock, we found here solitary strata of gypsum from 3 to 4 toises (19 to 25 English feet) *lower*. Farther to the west, near the junction of the Caura with the Orinoco, and to the east of the mission of S. Pedro de Alcantara, an extensive tract of dense forest sank down in an earthquake in 1790, and a lake was formed of more than 300 toises (1918 English feet) diameter. The tall trees (*Desmanthus*, *Hymenæas*, and *Malpighias*) long retained their foliage and verdure under the water.

(3) p. 2.—"*We seem to see before us a shoreless ocean.*"

The prospect of the distant Steppe is still more striking, when the spectator has been long accustomed in the dense

forests both to a very restricted field of view, and to the aspect of a rich and highly luxuriant vegetation. Ineffaceable is the impression which I received on our return from the Upper Orinoco, when, from the Hato del Capuchino, on a mountain opposite to the mouth of the Rio Apure, we first saw again the distant Steppe. The sun had just set; the Steppe appeared to rise like a hemisphere; and the light of the rising stars was refracted in the lowest stratum of air. The excessive heating of the plain by the vertical rays of the sun causes the variations of refraction,—occasioned by the effects of radiation, of the ascending current, and of the contact of strata of air of unequal density,—to continue through the entire night.

(4) p. 2.—“*The naked stony crust.*”

Immense tracts of flat bare rock form peculiar and characteristic features in the Deserts both of Africa and Asia. In the Schamo, which separates Mongolia and the mountain chains of Ulangom and Malakha-Oola from the north-west part of China, these banks of rock are called Tsy. They are also found in the forest-covered plains of the Orinoco, surrounded by the most luxuriant vegetation (Relation Hist. t. ii. p. 279). In the middle of these flat tabular masses of granite and syenite of some thousand feet diameter, denuded of all vegetation save a few scantily distributed lichens, we find small islands of soil, covered with low and always flowering plants which give them the appearance of little gardens. The monks of the Upper Orinoco regard these bare and perfectly level surfaces of rock, when

they are of considerable extent, as peculiarly apt to cause fevers and other illnesses. Several missionary villages have been deserted or removed elsewhere in consequence of this opinion, which is very widely diffused. Supposing the opinion correct, is such an influence of these flat rocks or laxas to be attributed to a chemical action on the atmosphere, or merely to the effect of increased radiation ?

(⁵) p. 2.—“*The Llanos and Pampas of South America, and the Prairies of the Missouri.*”

The physical and geognostical views entertained respecting the western part of North America have been rectified in many respects by the adventurous journey of Major Long, the excellent writings of his companion Edwin James, and more especially by the comprehensive observations of Captain Frémont. These, and all other recent accounts, now place in a clear light what, in my work on New Spain, I could only put forward as conjecture, on the subject of the mountain ridges and plains to the north. In the description of nature as well as in historical inquiries, facts long remain isolated, until by laborious investigation they are brought into connection with each other.

The east coast of the United States of North America runs from south-west to north-east, in the same direction as that followed in the southern hemisphere by the Brazilian coast from the river Plate to Olinda. In the two hemispheres two ranges of mountains exist at a short distance from the eastern coast; they are more nearly parallel to

each other than they are to the more westerly chain, called in South America the Cordilleras of Peru and Chili, and in North America the Rocky Mountains. The Brazilian system of mountains forms an isolated group, of which the highest summits (the Itacolumi and Itambe) do not rise above the height of 900 toises (5755 English feet). The most easterly ridges, which are nearest to the Atlantic, follow a uniform direction from SSW. to NNE.; more to the west the group becomes broader, but diminishes considerably in height. The Parecis hills approach the rivers Itenes and Guaporé, and the mountains of Aguapehi (to the south of Villabella) approach the lofty Andes of Cochabamba and Santa Cruz de la Sierra.

There is no immediate connection between the eastern and western chains,—the Brazilian mountains, and the Cordilleras of Peru,—for the low province of Chiquitos, which is a longitudinal valley running from north to south, and opening into the plains both of the Amazons and of the river Plate, separates Brazil on the east from the Alto Peru on the west. Here, as in Poland and Russia, an often almost imperceptible rise of ground (called, in Slavonian, *Uwaly*) forms the separating water-line between the Pilcomayo and the Madeira, between the Aguapehi and the Guaporé, and between the Paraguay and the Rio Topayos. The swell of the ground runs to the south-east from Chayanta and Pomabamba (lat. 19°—20°), traverses the province of Chiquitos, which, since the expulsion of the Jesuits, has again become almost a terra incognita, and forms, to the north-east, where there are only detached mountains, the “divortia